

6th Grade
UV

Friend or Foe

LEARNING OBJECTIVES

The student will understand where ultraviolet light (UV) fits in the spectrum of light and its affects on all life.

STUDENT PERFORMANCE OBJECTIVES

- ?? The student will understand what UV rays are and where they fit in the spectrum of light.
- ?? The student will learn how UV is beneficial to all life on Earth.
- ?? The student will begin to understand the dangers of UV radiation
- ?? The student will identify practices, choices and products that protect from overexposure to UV radiation

BACKGROUND

The sun delivers light and heat in a spectrum of rays called the electromagnetic spectrum. The electromagnetic spectrum breaks down by wavelengths into a table that is easy to use and understand. Short waves (UV) correspond to high energy, while long waves (IR heat) correspond to low energy. This spectrum is more than the visible colors we see when light is refracted or bent. The rainbow of light displayed is only a small part of the spectrum we see. The electromagnetic spectrum also consist of rays that we cannot see, such as **ultraviolet (UV) rays**, infrared rays and heat rays. While these rays are not visible to the human eye, we can detect them and observe their effects in the world around us. While some exposure to these rays is normal, healthy and sometimes beneficial, *overexposure* can be extremely dangerous.

Exposure to UV has some immediate, adverse effects as well as long term, adverse effects. Some immediate effects are sunburns, sunblisters and sunspots. Some long-term effects are skin cancers, premature aging, photosensitivity, and cataracts.

See other lessons on UV and sun, the UV Index, UV and ozone, UV and ozone in our breathing space, UV and ozone depletion, and UV monitoring.
<for more>

MATERIALS

Day 1:

- ?? prisms (for opening: optional)
- ?? Light set ups: UV light, fluorescent light, softwhite light, and control with no light (Controlled variables: lights should be the same height, size, etc.,)
- ?? Prepared, sterile Agar plates (4 per group)
- ?? Microscopes
- ?? Magnifying glass

Day 2:

- ?? [Worksheet UV/6-1: [Skin Diagram](#)]
- ?? [Information sheet UV/6-2: Dermatologist Information]
- ?? or [Dermatologist Video]
- ?? [Worksheet UV/6-3: [Skin Type](#)]

Day 3:

- ?? Clear plastic cups (3-5 per group)
 - ?? UV beads of a single color (1-2 per cup)
 - ?? Clear plastic wrap
 - ?? Auto glass tint samples (min: 2 shades)
- Cloth samples such as cotton , wool, rayon, polyester, etc. (Control Variable: same approx.: size, color, thickness, etc.)

SAFETY CONCERNS

- ?? Bacteria will grow and multiply in any stagnant materials, it is unlikely that they will be dangerous, but be sure to get rid of cultures as soon as the activity is complete.
 - ?? Wash containers and hands with hot water and soap.
- Caution students not to put their hands to their mouths after handling any lab specimens. Wash hands when done.

OPENING

Ask the Class:

What colors do you see in a rainbow or prism? What do you know about the electromagnetic spectrum? What are the visible parts of the electromagnetic spectrum?

Demonstrate to the Class:

Demonstrate the bending and refraction of light by using a prism. Have students tell you about the colors they see and possible reasons why they see them.

Discuss with the Class:

Discuss the sun's light as an array of color. Explain that the colors are separated when they are bent or refracted. The colors of the visible spectrum are red, orange, yellow, green, blue, indigo, and

violet. Have the students imagine the warmth of the sun on a summer day. Discuss the heat of the sun as part of other rays from the sun which are not visible. Tell the students that the invisible rays are called infrared, heat waves, and ultraviolet (UV) rays. Tell the students that the labs and lessons they will be doing will help them to determine the benefits and dangers of UV light and how to protect themselves from overexposure to the harmful effects of UV.

PROCEDURE

Day 1:

1. Outline the electromagnetic spectrum for the students.
2. Label the parts of the electromagnetic spectrum.
3. Determine where UV light fits on the electromagnetic spectrum and discuss its different wavelengths and why it is not visible.
4. Discuss energy as a function of wavelength (IR, less energy, UV more energy).
5. Discuss some of the benefits of UV light:
 - a) plant growth
 - b) heating foods at restaurants
 - c) correcting jaundice in babies
 - d) disinfecting foods and food areas
6. Tell the students that the lab they will begin today will demonstrate which of the lights will best prevent bacteria growth.
7. Distribute prepared Agar plates to student groups. Be careful not to contaminate the cultures.
8. Discuss the lab procedures and read the directions with the students.

Directions:

1. Have students place their thumbprints into the prepared Agar plates and label them.
2. Have students observe Agar plates under a microscope and draw a representation of what they see in their journals.
3. Have students place Agar plates under the different light setups.

4. Have students check Agar plates daily for at least one week
5. Have students observe their Agar plates under a microscope and diagram the bacteria growth they see.
6. Have students estimate percentage of growth change and draw a pie graph to display their estimates.
7. Have students compare the percentage of growth change from the first day to the last day of their observation. Have students make inferences and conclusions based on their data.

Day 2:

1. Ask the students if they have ever tried to get a sun tan or if they have ever had a sun burn.
2. Ask the students if they burn rapidly or if it takes them a long time to burn in the sun. Have the students explain why they think there is a difference.
3. Explain to the students that different skin types and pigmentation in the skin allow different people to burn or tan at different rates to varying degrees.
4. Demonstrate the bending or refracting of light using a prism. Have the students complete the Skin Survey [see worksheet: UV/6-3].
5. Explain that tanning is a skin's response to UV light. Tanning is a protective reaction, but it does not prevent skin cancer or other damaging effects from the UV rays.
6. Ask the students what they know about the layers of the skin.
7. Distribute the [Skin Diagram worksheet: UV/6-1]. Discuss the layers, functions, and different skin types.
8. Explain that the skin is made up of several layers to protect the body from: injury and infection, heat and light, and losing water.
9. Have the students complete their skin diagrams and list the functions of the skin on their worksheet.

10. Discuss with the students short term and long term effects of overexposure to the sun.
11. Have the students work in groups to create sun and UV awareness slogans. Slogans must tell what is UV and the dangers of UV.
12. Bring the class back together to discuss their slogans.

Day 3:

1. Discuss with the students different ways we can protect ourselves from ultraviolet (UV) radiation.
2. Ask the students if they think that different fabrics, window coverings or car tints can protect us from the sun.
3. Show the students UV beads and explain that they change color in the presence of UV light.
4. Tell the students that each group is going to test a variety of items to determine if they will provide protection from UV rays.
5. Have students place 1-2 UV beads in each of their cups.
6. Have the students place clear plastic wrap on one cup for the control.
7. Have the students place various items over the other cups.
 - a) Group 1: Control and 2 or more auto tints
 - b) Group 2: Control and 2 or more fabrics
 - c) Group 3: Control and 2 or more SPF sunscreens on plastic wrap(Other groups can do the same or come up with their own test items)
8. Have each group of students place their cups sun. Make sure that they place their cups in the same place at the same time.
9. Have the students observe the changes in the UV beads and record their results on data sheet [UV Protection Data Sheet: UV/6-4]
10. Have the students graph and compare their data to determine which item had created the least amount of color

**SO WHAT?
(LIFE APPLICATION)**

**CURRICULUM
EXTENSIONS**

change in the UV beads.

11. Have the students make inferences and draw conclusions based on their data.
12. Ask the students to discuss their observations and explain if there was any difference in color change under the different items. Did one item protect the beads from more UV light than another? Students need to explain their answer.
13. Have the students check the UV rating at the [Ecoplex website](#) to learn more about the UV ratings and when they need to use protection from UV rays.

Have the students come up with a plan to inform their families of ways to protect themselves from the harmful effects of UV rays.

Math:

Create a graph that compares the effect the items had on the UV beads.

Language Arts:

Have the students write a lab report on their experiments, focusing on analysis and conclusions.

Technology:

Using a spreadsheet program, have the students create a graph using their data.

Art/Music:

Have the students create posters to inform their peers of the dangers of tanning and display the posters around the school.

Science:

Have the students check the effect of UV light on different bacteria growth by getting bacteria samples from different places around the school (remember, when comparing the effect of the light you must control the type of bacteria, so make sure students use samples from each area for each light)

Have the students create sun safety surveys and determine the percentages of students in their grade level who protect themselves from UV rays.

RESOURCES

Social Studies:

Have students research the role of the sun in different cultures.

TEKS: 6.1(A,B), 6.2 (A,B,C,D,E), 6.4 (A,B)

<http://www.ecoplex.unt.edu/main.html>

<http://imagine.gsfc.nasa.gov/docs/teachers/lessons/roygbiv/roygbiv.html>

<http://members.aol.com/EnidHighIN/>

<http://www.mauui.net/~southsky/introtohtml>

<http://www.c-hawks.org/webaa/websun/Skinqfc.htm>